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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

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ORGANIZATIONAL MAINTENANCE
MANUAL

TEST SET,
RECEIVER-TRANSMITTER
TS-2327/APN-168

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HEADQUARTERS, DEPARTMENT OF THE ARMY
NOVEMBER 1966

WARNING

Be careful when working on the 115-volt ac test points and line connections. Serious injury or death may result from contact with these points.

DON'T TAKE CHANCES!

TECHNICAL MANUAL

No. 11-6625-685-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 23 November 1966

Organizational Maintenance Manual
TEST SET, RECEIVER-TRANSMITTER
TS-2327/APN-168

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope of Manual

a. This manual describes Test Set, Receiver-Transmitter TS-2327/APN-168 (fig. 1-1) and provides instructions for installation, operation and organization maintenance. It includes instructions for operation, cleaning and inspection of the equipment, replacement of parts available to the operator and organizational repairman.

b. The organizational repair parts and special tools lists will appear in TM 11-6625-685-25P.

1-2. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment. Pam 310-4 is an index of current technical manuals, technical bulletins, supply manuals, (types 7, 8 and 9), supply catalogs, supply bulletins, lubrication orders, and modification work orders which are available through publications supply channels. The index lists the individual parts (-10, -20,

etc.) and the latest changes to and revisions of each equipment publication.

1-3. Forms and Records

a. *Reports of Maintenance and Unsatisfactory Equipment.* Use equipment forms and records in accordance with instructions in TM 38-750.

b. *Report of Damaged or Improper Shipment.* Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), NAVSANDA Publication 378 (Navy), and AFR 71-4 (Air Force).

c. *Reporting of Equipment Manual Improvements.* Report of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSEL-MR-NMP-AD, Fort Monmouth, N.J. 07703.

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

a. Test Set, Receiver-Transmitter TS-2327/APN-168 is an interconnecting and power control facility which enables maintenance personnel to service Receiver-Transmitter, Radar OA-7401/APN-168 independent of other Doppler Navigation Set AN/ASN-64 components. In addition to controlling power, TS-2327/APN-168 generates modulation switch-

ing signals normally supplied by Antenna AS-1766/APN-168 to OA-7401/APN-168. The controls mounted on TS-2327/APN-168 permit operator selection of the test conditions required for the maintenance of OA-7401/APN-168.

b. A test point field, three coaxial connectors, and a meter mounted on the TS-2327/APN-168 permit monitoring the test signals

supplied to OA-7401/APN-168 and its response to the signals. OA-7401/APN-168 is connected to TS-2327/APN-168 by means of two cables which are terminated by multipin connectors. A third cable is used to connect 115 volts ac, 400 cps power to TS-2327/APN-168.

1-5. Technical Characteristics

Line voltage input _____ 115 volts, single phase,
400 cps.

Power consumption _____ 250 volt-amperes

Simulated signals:

Modulation synchro- 40 cps, square wave.
nizing frequency (4FR)

Weight _____ 32 pounds.

1-6. Description of Test Set, Receiver-Transmitter TS-2327/APN-68

(fig. 1-2)

TS-2327/APN-168 consists of cables, controls, and connectors secured to a common panel. The cables are permanently attached and are labeled to indicate their specific use. TS-2327/APN-168 is cased in a molded fiberglass, lightweight, rectangular-shaped contain-

er, sealed by a rubber gasket which makes the case waterproof. The case consists of a top and bottom which are attached together by four hinged butt leaves that permit separation of the two parts. The bottom is equipped with a carrying handle; and in storage, the top is secured to the bottom by means of the hinged butt leaves as well as two winged twist lock clamps. An air release valve is mounted on the bottom to facilitate opening. A cable retainer subassembly is hinged to the inside of the top and is held in the store position by means of two studs and two lock bushings. The cable retainer subassembly is used to store the cables of the TS-2327/APN-168.

1-7. Additional Equipment Required

To complete the test connections between the TS-2327/APN-168 and the OA-7400/APN-168 two Cable Assemblies, Radio Frequency CG-3295/U (5 ft) are required. These cable assemblies are part of Maintenance Kit, Electronic Equipment MK-866/ASN-64. The test equipment used with the TS-2327 APN-168 normally is supplied to the maintenance man responsible for the servicing of the OA-7400/APN-168.

CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unpacking

a. *Packaging Data.* When packed for shipment, TS-2327/APN-168 is packed in a fiberboard carton along with the equipment manual. A special shipping carton is also used in Open 2-2. The overall dimensions of the carton are 16-1/2 by 16-5/8 by 11-1/2 inches, the volume is 1.6 cubic feet, and the shipping weight is 32 pounds.

b. *Removing Controls.*

- (1) Open the fiberboard carton, after cutting the two ties from top and the fiberboard carton.
- (2) Remove the top cover.

(To be published later)

and 2-2, Figure 1-2, for the next step.

Figure 1-2. Test Set, Receiver-Transmitter TS-2327/APN-168, with top removed.

2-2. *Inspecting Received Equipment*

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage to DD Form 6 (Open 1-3).

b. See that the equipment is correctly packed on the packing slip. If a packing slip is not available, count the equipment against the basic issue form (Open 2). Report all discrepancies in accordance with TM 95-700.

Storage of a failure occurring in equipment that has, after proper functioning of the equipment, should not prevent use of the equipment.

c. If the equipment has been modified, the differences between the original and the modification may reduce reliability. If the equipment has been modified, and this is not fully apparent on the front panel and the documentation plate, it is modified and the unmodified modification changes resulting from the modification have been entered in the equipment manual.

d. Current RCM symbols on the equipment.

2-3. *Assembly* is required with the chassis and lamps in place. Check that the following chassis and lamps are installed and not damaged (Fig. 2-2).

- a. 115 VAC RA.
- b. 115 VAC SA.
- c. 115 VAC 1 1/2A.
- d. 20 VDC 1/SA.
- e. 20 VDC 1/SA.
- f. Power on lamp.
- g. P.T. on pilot lamp.
- h. PDSR TESTER indicator lamp.

Section II. OPERATOR'S CONTROLS AND INDICATORS

2-4. Test Set, Receiver-Transmitter TS-2327/APN-168 Controls and Indicators (See 2-5)

a. *Controls and Indicators*

Control indicator (see 2-5)

POWER SWITCH

Power switch

Controls indicator of 115 volts ac power. When the switch is in ON position, lights become illuminated.

CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unpacking

a. Packaging Data. When packed for shipment, TS-2327/APN-168 is sealed in a fiberboard carton along with the equipment manuals. A typical shipping pack is illustrated in figure 2-1. The outside dimensions of the carton are 16-1/2 by 16-3/4 by 11-1/2 inches, the volume is 1.8 cubic feet, and the shipping weight is 32 pounds.

b. Removing Contents.

- (1) Open the fiberboard carton, after cutting the reinforced gum tape and the fiberglass gum tape.
- (2) Remove the top cellulosic cushion and the cushion wrapped around TS-2327/APN-168.
- (3) Remove TS-2327/APN-168.

2-2. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 1-3).

b. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the basic issue items list (appx B). Report all discrepancies in accordance with TM 38-750.

Shortage of a minor assembly or part that does not affect proper functioning of the equipment should not prevent use of the equipment.

c. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If the equipment has been modified, the MWO number will appear on the front panel near the nomenclature plate. If modified, see that any operational instruction changes resulting from the modification have been entered in the equipment manual.

Note. Current MWO's applicable to the equipment are listed in DA Pam 310-4.

2-3. Seating of Fuses and Lamps

TS-2327/APN-168 is shipped with the fuses and lamps in place. Check that the following fuses and lamps are installed and not damaged (fig. 2-2).

- a.* 115 VAC 3A.
- b.* 115 VAC 2A.
- c.* 115 VAC 1 1/2A.
- d.* 26 VDC 1/8A.
- e.* 26 VDC 1/8A.
- f.* Power on pilot lamp.
- g.* R/T on pilot lamp.
- h.* FUSE TESTER indicator lamp.

Section II. OPERATOR'S CONTROLS AND INDICATORS

2-4. Test Set, Receiver-Transmitter TS-2327/APN-168 Controls and Indicators (fig. 2-2)

a. Controls and Indicators.

Control, indicator, fuse, or connector	Function
POWER GROUP	
Power switch	Controls application of 115 volts ac power. When the switch is in ON position, input power is connected

Control, indicator, fuse, or connector	Function
Power on pilot lamp	When the switch is in OFF position, input power is turned off.
Variable power transformer	When lighted, indicates power is connected. When not lighted, indicates power is not connected.
Voltmeter	Adjusts voltage level of input power applied.
115 VAC 3A fuse	Indicates level of voltage applied.
115 VAC 2A fuse	Powerline fuse. Protects against damage caused by line surges, application of wrong voltage, or internal short circuit due to part malfunction.
115 VAC 1 1/2A fuse	115 volt ac line fuse for OA-7400/APN-168 which is supplied 115 volts ac power through two lines. One line supplies filament power and the other supplies power to remaining 115-volt ac loads. Protects loads on second line from damage caused by application of wrong line voltage, surges, or short circuits due to part malfunction.
26 VDC 1/8A fuse (left)	Filament circuit fuse. Protects filament circuit in OA-7400/APN-168 from damage caused by part malfunction.
26 VDC 1/8A fuse (right)	Relay circuit fuse. Protects 26 volt dc relay circuit from damage caused by part malfunction.
FUSE TESTER socket	Relay circuit fuse. Protects CA-7400/APN-168 26 volt dc relay circuit and 26 volt dc power source (TS-2327/APN-168) from damages caused by part malfunction.
FUSE TESTER indicator	Provides a means of connecting fuses across FUSE TESTER indicator for testing fuses.
R/T POWER rotary switch	<ul style="list-style-type: none"> a. Provides a visual indication of condition of fuse under test. b. When lighted and with no fuse in FUSE TESTER socket, indicates power is connected. c. When not lighted and with no fuse in FUSE TESTER socket, indicates power not connected. d. When not lighted and with fuse in FUSE TESTER socket, indicates fuse is satisfactory. e. When lighted and with a fuse in FUSE TESTER socket, indicates fuse under test is open. <ul style="list-style-type: none"> a. Controls application of 115 volt ac power to OA-7400/APN-168. b. When set to the STAND BY position, 115 volts ac power is applied to OA-7400/APN-168 filament circuit. c. When set to ON position, 115 volts ac power is applied to remaining 115 volts ac loads in OA-7400/APN-168.
R/T ON indicator	<p><i>Note.</i> After filament power is applied 25 seconds time delay is provided before applying remaining 115 volts ac power.</p>
MODULATING FREQUENCY rotary switch	<ul style="list-style-type: none"> Indicates 115 volts ac power is applied to (other than filament circuit) OA-7400/APN-168.
	<ul style="list-style-type: none"> a. Controls modulating frequency produced by Modulator, Radar MD-628/APN-168 of the OA-7400/APN-168. b. When set to 670, the modulating frequency is 670 kc. c. When set to 1080, the modulating frequency is 1080 kc.

Control, indicator, fuse, or connector	Function
4FR switch -----	<p>d. When set to 670/1080, the modulating frequency alternates between 1080 kc and 670 kc at the rate of 40 cps (4FR).</p> <p>a. Controls application of 4FR switching signal to MODULATING FREQUENCY rotary switch which in turn couples signal to MD-628/APN-168.</p> <p>b. When set to ON, switching signal is coupled to switch.</p> <p>c. When set to OFF, switching signal is turned off.</p>
AGC INPUT-FORWARD potentiometer -----	Controls level of simulated agc voltage applied to "forward" Amplifier, Intermediate Frequency AM-4328/APN-168.
AGC INPUT-BACKWARD potentiometer -----	Controls level of simulated agc voltage applied to "backward" Amplifier. Intermediate Frequency AM-4328/APN-168.

INPUT GROUP

IF MIXER connector -----	Permits coupling an IF test signal through a matching network to IF connectors of Receiver-Transmitter, Radar OA-7401/APN-168.
IF 'A' connector -----	An output connector of the impedance matching network used to couple the IF test signal to OA-7401/APN-168.
IF 'B' connector -----	An output connector of the impedance matching network used to couple the IF test signal to OA-7401/APN-168.

b. *Test Points* (fig. 2-3). There are 42 appropriately marked test points provided for monitoring and bridging. The marking which

appears at each test point indicates the signal that is available at that test point.

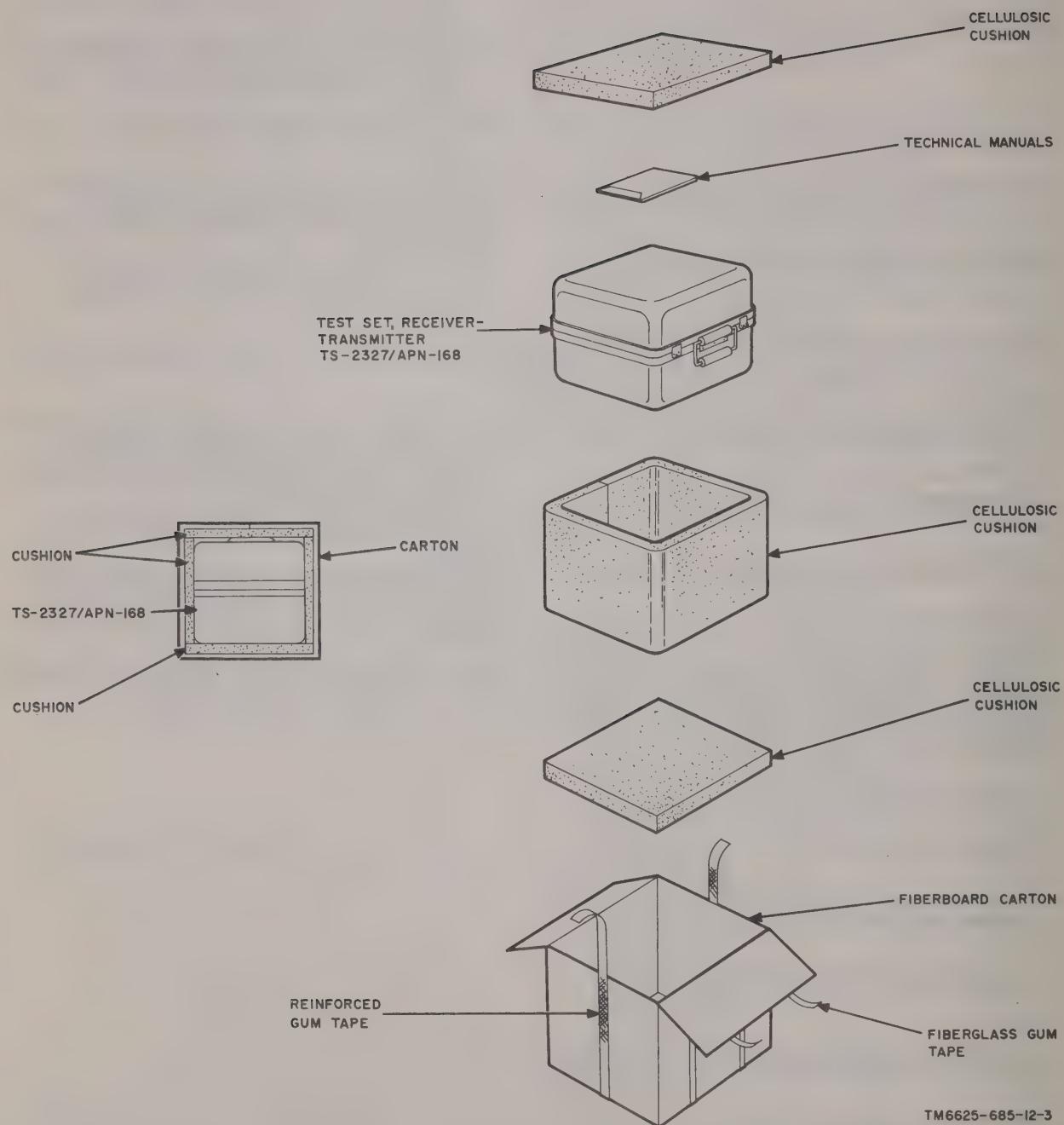


Figure 2-1. Test Set, Receiver-Transmitter TS-2327/APN-168 typical packaging.

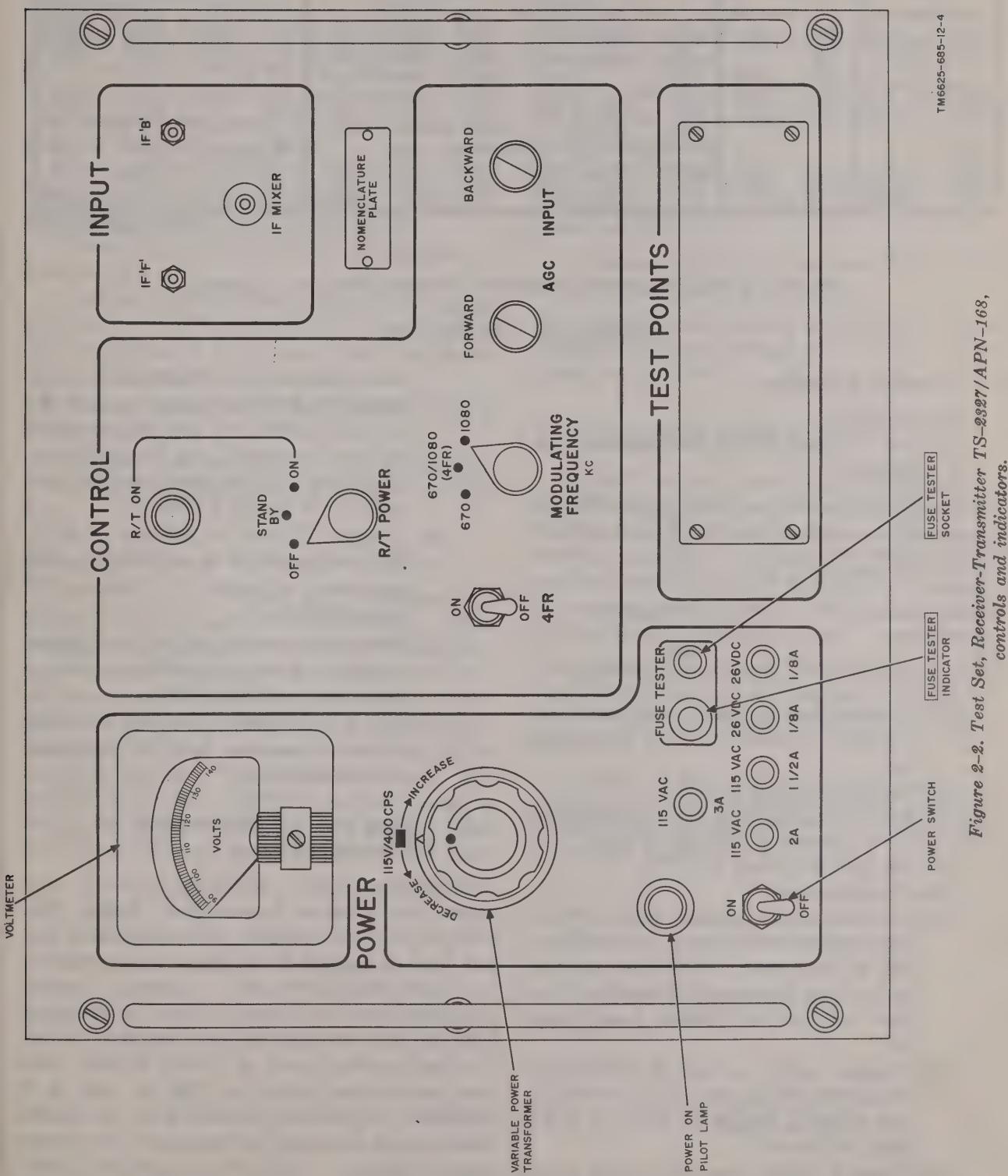
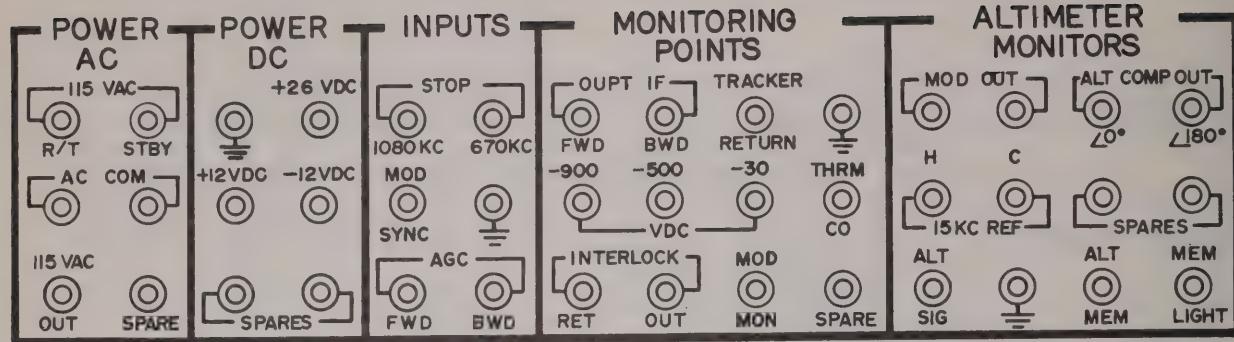


Figure 2-2. Test Set, Receiver-Transmitter TS-2327/APN-168, controls and indicators.



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Figure 2-3. Test Set, Receiver-Transmitter TS-2327/APN-168 test points.

Section III. OPERATION

2-5. Starting Procedure

a. Preliminary.

- (1) Set TS-2327/APN-168 controls as follows:

Control	Position
Power switch -----	OFF
R/T POWER rotary switch.	OFF
Variable power transformer.	Mid position
4FR -----	OFF

- (2) Connect power (no marker) cable of TS-2327/APN-168 to 115 volts, 400 cps.
- (3) Set power switch to ON.
- (4) Adjust variable power transformer for a voltmeter reading of 115.
- (5) Set power switch to OFF.

b. Test Connections.

- (1) Connect cable marked RECEIVER-TRANSMITTER TEST CONNECTOR to connector TEST J01 located underneath Receiver-Transmitter, Radar OA-7401/APN-168 front cover.
- (2) Connect cable marked RECEIVER-TRANSMITTER MAIN CONNECTOR to plug P1209 at rear of OA-7401/APN-168.
- (3) Using a Cable Assembly, Radio Frequency CG-3295/U (5 ft) (part of

Maintenance Kit, Electronic Equipment MK-866/ASN-64), connect the TS-2327/APN-168 IF 'A' connector to OA-7401/APN-168 IF AMPL 'A' connector. In the same manner connect IF 'B' to IF AMPL 'B'.

- (4) Connect TS-2327/APN-168 IF MIXER connector to a radio frequency generator adjusted to produce IF signal (3.3 mc).
- (5) Set power switch to ON and adjust variable power transformer for a voltmeter reading of 115.
- (6) Set R/T POWER switch to ON. After 25 seconds R/T ON indicator lamp should light.

2-6. Typical Use of MODULATING FREQUENCY Switch

Modulator, Radar MD-628/APN-168 contained in Receiver-Transmitter, Radar OA-7401/APN-168 develops the modulating signal that is applied to Transmitter Subassembly MX-6816/APN-168. During normal operation the modulating signal is switched between 670 to 1080 kc at a rate of 40 cps. The modulation index at 670 kc differs from the modulation index at 1080 kc and it is necessary to stop the switching of the modulator output to permit adjustment of the modulation indexes. The MODULATING FREQUENCY switch selects the working condi-

tions of the modulator for adjustment purposes. The procedure which follows is a typical use of the MODULATING FREQUENCY switch.

Note. When using the MODULATING FREQUENCY rotary switch in the 670/1080 (4FR) position, it is necessary to set the 4FR switch to the ON position to obtain switching of the modulator output.

a. Remove case of OA-7401/APN-168 and pull out interlock switch S6001.

b. Connect RF output at the rear of OA-7401/APN-168 to ATTENUATOR INPUT of Spectrum Analyzer Set AN/UPM-84.

c. Start TS-2327/APN-168 as detailed in paragraph 2-5.

d. Adjust AN/UPM-84 to display RF signal produced by OA-7401/APN-168.

e. Set resistors R6411 and R6412 of modulator fully clockwise.

f. Set MODULATING FREQUENCY switch to 1080 kc.

g. Adjust resistor R6411 for a modulation index of 1.5 as displayed on AN/UPM-84 (fig. 2-4).

2-7. Typical Use of AGC INPUT Controls

Two IF agc voltages are developed in Navigation Set, Radar AN/APN-168. One voltage is applied to the "forward" Amplifier, Intermediate Frequency AM-4328/APN-168 and the other voltage is applied to the "backward" IF amplifier. Adjustment of IF amplifiers requires that the agc voltages be set to specified values. The FORWARD and the BACKWARD AGC INPUT controls provide the operator control of the agc levels. The FWD and BWD AGC test points can be used

to establish the desired agc level. The following procedure is a typical use of the AGC INPUT where an agc level of +10 vdc is required.

a. Start TS-2327/APN-168 as described in paragraph 2-5.

b. Connect Multimeter ME-26/U (adjusted to read dc volts), between FWD AGC test point and ground.

c. Using FORWARD AGC INPUT potentiometer, set agc voltage to +10 vdc as displayed on ME-26/U.

d. Connect ME-26/U between BWD AGC test point and ground.

e. Using BACKWARD AGC INPUT potentiometer, set agc voltage to +10 vdc as displayed on ME-26/U.

2-8. Typical Use of 4FR Switch

The 4FR switch controls the application of the 4FR (40 cps) signal to the MODULATING FREQUENCY rotary switch. This latter switch, when set to the 670/1080 (4FR) position, connects the 4FR signal to the modulator contained in Receiver-Transmitter, Radar OA-7401/APN-168 (para 2-6).

a. When it is desired to switch modulator output frequency at 40 cps, set MODULATING FREQUENCY rotary switch to 670/1080 (4FR).

b. When it is desired to turn off 4FR switching of the modulator output frequency without moving MODULATING FREQUENCY rotary switch, set 4FR switch to OFF.

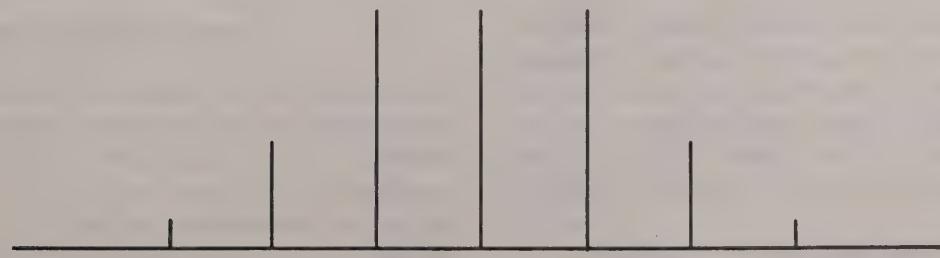


Figure 2-4. Modulation index 1.5.

2-9. Use of R/T POWER Rotary Switch

a. When it is desired to turn off all ac power applied to OA-4700/APN-168 set R/T POWER switch to OFF.

b. When it is desired to apply filament power only to OA-7400/APN-168, set R/T POWER switch to STAND BY.

2-10. Typical Use of FUSE TESTER

To check a fuse, proceed as follows:

a. Connect TS-2327/APN-168 to 115 volts ac, 400 cps. FUSE TESTER indicator lamp should light.

b. Remove dummy fuse from FUSE TESTER socket.

c. Insert fuse to be tested into FUSE TESTER socket. If FUSE TESTER indicator lamp extinguishes, fuse is satisfactory. If FUSE TESTER indicator lamp remains lighted fuse is faulty.

2-11. Stopping Procedure

To stop TS-2327/APN-168 set R/T POWER switch to OFF, power switch to OFF, and disconnect the equipment.

CHAPTER 3

MAINTENANCE

Section I. GENERAL

3-1. Scope of Maintenance

The maintenance duties assigned to the operator of Test Set, Receiver-Transmitter TS-2327/APN-168 are listed below together with reference paragraphs covering the specific maintenance function. The duties include inspection, testing, and servicing instructions for performing preventive maintenance services. These services do not require special tools or test equipment other than those allocated in paragraph 3-2.

a. Daily preventive maintenance checks and services (para 3-5).

b. Weekly preventive maintenance checks and services (para 3-6).

c. Quarterly preventive maintenance checks and services (para 3-7).

d. Cleaning (para 3-8).

e. Painting (para 3-9).

f. Troubleshooting (para 3-10).

g. Repairs and adjustments (para 3-12).

3-2. Tools, Test Equipment, and Materials

a. *Tools.* In addition to the tools normally available to the user of TS-2327/APN-168, the following special tools are required:

- (1) Insertion tool (Deutsch part number M15513-20).
- (2) Removal tool (Deutsch part number M15513-20).
- (3) Crimp tool (Deutsch part number 15500-20).
- (4) Crimp tool (Cannon part number MS3191-1) with positioner (Cannon part number L16-3191-1).

b. *Test Equipment.* The only test equipment required is normally supplied to the user of TS-2327/APN-168.

c. *Materials.* The following materials are required by the organizational repairman.

- (1) Cleaning Compound (FSN 7930-395-9542).
- (2) Sandpaper number 000.
- (3) Grey enamel paint (MIL-E-15090).

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-3. Preventive Maintenance

Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in a serviceable condition, prevent breakdown, and assure maximum operational capability. Preventive maintenance is the responsibility of all categories of maintenance concerned with the equipment and includes the inspection, testing, and repair or replacement of parts or units that inspection and checks

indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of TS-2327/APN-168 at organizational maintenance level are made at daily, weekly, and quarterly intervals unless otherwise directed by the commanding officer.

a. *Systematic Care.* The procedures given in paragraph 3-4 through 3-10 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services chart (para 3-5, 3-6, and 3-7) outline functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is in good general (physical) condition and in good operating condition. To assist the organizational maintenance repairman in determining and maintaining serviceability, the charts indicate what to check, how to check, and what the normal conditions are; the *Reference* column lists the appropriate references that contain the repair or replacement procedures. If the defect cannot be remedied by performing the corrective action indicated; higher category of mainte-

nance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

3-4. Preventive Maintenance Checks and Service Periods

Preventive maintenance checks and services of TS-2327/APN-168 are required daily, weekly, and quarterly.

a. Paragraph 3-5 specifies checks and services of TS-2327/APN-168 that must be accomplished daily.

b. Paragraphs 3-6 and 3-7 specify additional checks and services that must be performed on a weekly and quarterly basis respectively.

3-5. Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Completeness -----	Check that TS-2327/APN-168 is complete -----	Appx. B
2	Connectors -----	Check all connectors and ensure that they are clean, have no broken pins, and are secure.	Para 3-8 Para 3-12
3	Meter and indicator glasses and lenses.	Check all meter and indicator glasses and lenses and insure that their surfaces are clean and not cracked or damaged.	Para 3-8
4	Knobs and switches.	Check each control for proper mechanical action. Observe that mechanical action is positive without backlash, binding or scraping. Adjust controls if required.	
5	Fuses -----	Check all fuses and ensure that fuses are not damaged in any way. Replace faulty fuses.	
6	Preliminary -----	<p>a. Set controls as follows:</p> <p>(1) Power switch ----- OFF. (2) R/T POWER rotary switch ----- OFF. (3) 4FR switch ----- OFF. (4) MODULATING FREQUENCY rotary switch 670.</p> <p>b. Connect the power cable (no marker) to 115 volts ac, 400 cps.</p>	
7	FUSE TESTER indicator.	Observe that FUSE TESTER indicator lights -----	Para 3-10
8	FUSE TESTER socket.	<p>a. Insert a known good fuse into FUSE TESTER socket.</p> <p>b. Check that FUSE TESTER indicator extinguishes.</p>	Para 3-10
9	Power switch -----	Set to ON. Observe that power on pilot lamp lights.	Para 3-10
10	Variable power transformer.	Adjust the variable power transformer for a voltmeter reading of 115.	Para 3-10
11	MODULATING FREQUENCY rotary switch.	<p>a. Set power switch to OFF.</p> <p>b. Set MODULATING FREQUENCY rotary switch to 1080.</p>	Para 3-10

Sequence No.	Item	Procedure	References
12	4FR switch -----	<ul style="list-style-type: none"> c. Check for a short circuit between STOP 1080 KC and DC ground test points. d. Set MODULATING FREQUENCY rotary switch to 670. e. Check for a short circuit between STOP 670 KC and ground test points. a. With power switch in OFF position, set 4 FR switch to ON. b. Set MODULATING FREQUENCY rotary switch to 4FR. 	Para 3-10
13	AGC INPUT potentiometers.	<ul style="list-style-type: none"> a. Set 4FR switch to OFF. b. Measure resistance between +12 VDC test point and DC ground test point. 	Para 3-10
14	FORWARD AGC potentiometers.	<ul style="list-style-type: none"> c. Check that ohmmeter readings approximately 500 ohms. a. While measuring resistance between pin 10 of the RECEIVER-TRANSMITTER MAIN CONNECTOR cable connector and ground, rotate FORWARD AGC INPUT potentiometer fully clockwise. b. Check that resistance varies between 500 and zero ohms. 	Para 3-10
15	BACKWARD AGC INPUT potentiometer.	<ul style="list-style-type: none"> a. While measuring the resistance between pin 11 of the RECEIVER-TRANSMITTER cable connector and ground, rotate BACKWARD AGC INPUT potentiometer fully clockwise. b. Check that resistance varies between 500 and zero ohms. 	Para 3-10
16	IF 'A' connector -----	<ul style="list-style-type: none"> a. Check that resistance between the center pin of the IF 'A' connector and ground is approximately 48 ohms. b. Check that resistance between center pin of IF 'A' connector and the center pin of IF MIXER connector is approximately 75 ohms. 	Para 3-10
18	IF 'B' connector -----	<ul style="list-style-type: none"> a. Check that resistance between the center pin of the IF 'B' connector and ground is approximately 48 ohms. b. Check that resistance between center pin of the IF MIXER connector is approximately 75 ohms. 	Para 3-10

3-6. Weekly Preventive Maintenance and Services Chart

Sequence No.	Item	Procedure	References
1	Cables -----	Inspect cords, cables, and wires for chafed, cracked, or frayed insulation. Replace connectors that are broken, arced, stripped, or worn excessively.	Para 3-12
2	Handles and latches.	Inspect handles, latches, and hinges for looseness. Replace or tighten as necessary.	
3	Metal surfaces of dust cover.	Inspect exposed metal surfaces for rust and corrosion. Clean and touch up paint as required.	Para 3-9

3-7. Quarterly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Publications -----	See that all publications are complete, serviceable and current.	DA Pam 310-4
2	Modifications -----	Check DA Pam 310-4 to determine if new applicable MWO's have been published. ALL URGENT MWO's must be completed immediately. All NORMAL MWO's must be scheduled.	TM 38-750 and DA PAM 310-4
3	Spare parts -----	Check all spare parts (operation and organizational) for general condition and method of storage. No overstock should be evident and all shortages must be on valid requisitions.	Appx B and TM 11-6625-685-25P

3-8. Cleaning

Inspect exterior surfaces of TS-2327/APN-168. Exterior surfaces should be clean, free of dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean soft cloth.

b. Remove grease, fungus, and ground-in dirt from case; use a cloth dampened (not wet) with cleaning compound (FSN 7930-395-9542).

c. Remove dirt from connectors with a brush; remove moisture with a dry cloth.

Caution: Do not press the voltmeter glass when cleaning; the glass may be damaged.

d. Clean voltmeter glass; use a soft clean cloth. If dirt is difficult to remove, dampen cloth with water; mild soap may be used to make the cleaning more effective.

3-9. Painting Instructions

The only part of TS-2327/APN-168 that requires painting is the dust cover secured to rear. To touch up dust cover, proceed as follows:

Note. Refer to applicable cleaning and refinishing practices specified in TB SIG 364.

a. Remove rust and corrosion from metal surfaces by lightly sanding them with No. 000 sandpaper.

b. Brush two thin coats of grey enamel that conforms to MIL-E-15090 on the base metal to protect it from further corrosion.

c. Bake dust cover only in a preheated oven at 275° F. for 4-1/2 hours.

3-10. General Troubleshooting Information

Troubleshooting TS-2327/APN-168 is based upon the operational check contained in the daily preventive maintenance checks and services chart. To troubleshoot the equipment, perform all functions starting with item number six in the daily preventive maintenance checks and services chart (para 3-5) and proceed through the items until an abnormal condition or result is observed. When an abnormal fault or condition is observed, note the item number and turn to the corresponding item number in the troubleshooting chart (para 3-11). Perform the checks and corrective actions indicated in the troubleshooting chart. If the corrective measures indicated do not result in correction of the trouble or if the item number is not listed in paragraph 3-11, higher category of maintenance is required.

3-11. Troubleshooting Chart

Item No.	Trouble symptom	Probable Trouble	Checks and corrective measures
7	FUSE TESTER indicator does not light.	FUSE TESTER indicator lamp is defective.	Replace FUSE TESTER indicator lamp (3-12 a).

Item No.	Trouble symptom	Probable Trouble	Checks and corrective measures
9	Power on pilot lamp does not light.	a. 115 VAC 3A fuse is blown. b. Power on pilot lamp is defective.	a. Replace 115 VAC 3A fuse. b. Replace power on pilot lamp lamp (3-12 a).
10	Voltmeter reading does not change.	Knob loose on variable power transformer.	Tighten knob.

3-12. Repairs and Adjustments

a. Replacement of Indicator Lamps.

- (1) Unscrew lamp lens.
 - (2) Remove lamp.
 - (3) Insert new lamp and screw lens back on.
- b. Repair of RECEIVER-TRANSMITTER MAIN CONNECTOR Cable Assembly.**
- (1) Loosen two screws in cable clamp.
 - (2) Remove two machine screws and two lockwashers holding connector in shell.
 - (3) Slide shell back along cable exposing leads attached to connector.

Note. Individual contacts of connector can be replaced without having to replace all contacts or entire connector.

- (4) Pull on lead of contact that is to be replaced.
- (5) Cut off old contact and cut insulation back 1/4 of an inch.
- (6) Insert positioner type L16-3191-1 into crimp tool type MS3191-1.
- (7) Insert contact into crimping tool.
- (8) Insert stripped wire into contact and close tool completely.
- (9) Remove wire and check that wire appears in inspection hole of contact.
- (10) If required tag lead.
- (11) Repeat (4) through (10) above as required.
- (12) Insert contacts back into the connector assembly and reassemble connector.
- (13) Check that electrical connections have been correctly made by making a continuity test between the points listed below.

Note. Terminal board connections listed below are connected to the TEST POINTS field. To find a test point which corresponds to a terminal board connection, note terminal board designation and refer to figure 3-1.

RECEIVER-TRANSMITTER MAIN CONNECTOR contact	Terminal
1	TB01-5
2	TB01-13
3	TB01-14
4	TB01-27
5	TB01-29
7	TB01-35
9	TB01-36
10	TB01-5
11	TB01-5
14	TB01-32
15	TB01-30
17	TB01-24
18	TB01-19
20	TB01-18
21	TB01-17
22	TB01-4
23	TB01-3
24	TB01-2
25	TB01-1

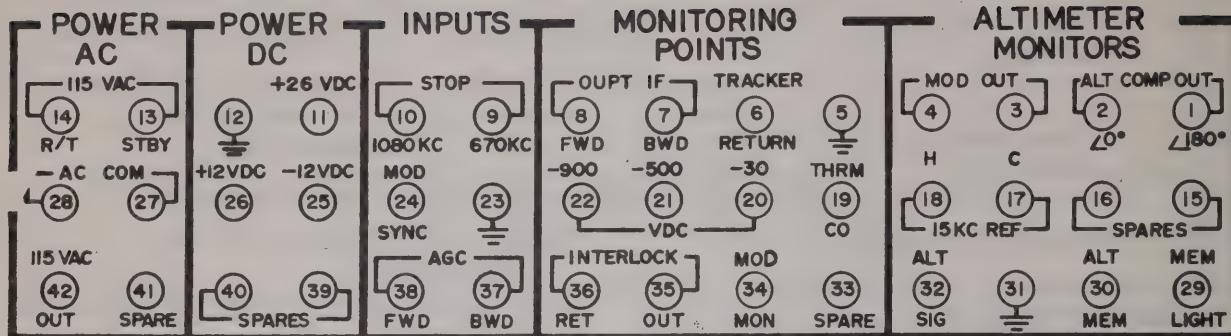
Notes:

- a. The AGC INPUT potentiometers must be positioned for zero resistance between the indicated points.
- b. The 4FR switch must be set to ON and the MODULATING FREQUENCY rotary switch must be set to 670/1080 position for zero resistance between the indicated points.

c. Repair of RECEIVER-TRANSMITTER TEST CONNECTOR Cable Assembly.

Note. Individual contacts of connector can be replaced without having to replace all contacts or entire connector.

- (1) Loosen cable clamp and unscrew clamp assembly from connector shell.
- (2) Slide clamp assembly back along the cable.
- (3) Roll insulating tubing sufficiently to provide access to wires which require servicing.



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Figure 3-1. Test point index.

- (4) Remove a contact and its associated wire as follows:
 - (a) Grasp connector body firmly between thumb and fingers with front facing you.
 - (b) Locate insert hole which holds contact to be removed
 - (c) Slide tube of the removal tool (Deutsch No. M15515-20) towards tool handle. While holding tube in this position, center probe on contact. Do not apply pressure.
 - (d) Slide tube straight into connector, applying moderate pressure to tube.

Caution: Do not twist or tilt removal tool at any time.

- (e) Refer to figure 3-2. Release pressure on tube and apply pressure to probe handle.
- (f) Remove tool by pulling back on handle.
- (g) Remove contact by pulling on wire.
- (h) Tag lead.
- (5) Repeat (4) above as often as required.
- (6) If required replace old contact with a new contact as follows:
 - (a) Remove old contact.
 - (b) Strip the insulation from the wire, baring 3/16- to 7/32-inch of wire at the end.
 - (c) Drop a size 20 contact pin into crimping tool (Deutsch No. 15500-20).

- (d) If necessary reform wire by twisting strands together.
- (e) Insert wire into open end of contact and depress crimping tool lever.
- (f) Remove wire and contact.
- (7) Repeat (6) above as often as required.
- (8) Working from rear of connector, install contacts into connector as follows:
 - (a) Push contact and wire into contact cavity, being certain not to push contact all the way in.
 - (b) Place insertion tool (Deutsch No. M15513-20) against shoulder of contact and push tool straight into



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Figure 3-2. Removal of contact.

connector cavity until contact snaps into its retained position.

- (c) Pull tool straight back.
- (9) Repeat (8) above as often as required.
- (10) Roll insulating tubing back into place.
- (11) Screw clamp assembly into connector body.
- (12) Secure clamp to cable assembly.
- (13) Check that connections have been made correctly by making a continuity test between the points listed below.

Note. The terminal board connections listed below are connected to the TEST POINTS field. To find a test point which corresponds to the terminal board designation, note terminal board connections and refer to figure 3-1.

RECEIVER-TRANSMITTER TEST CONNECTOR contact	Terminal
1	TB01-12
2	TB01-25
3	TB01-26
5	TB01-6
6	TB01-20
7	TB01-21
8	TB01-22
9	TB01-34
10	TB01-10
11	TB01-9
12	TB01-38
13	TB01-37
14	TB01-8
15	TB01-7
17	TB01-42
18	TB01-28



CHAPTER 4

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

4-1. Repacking for Shipment or Limited Storage

The exact procedure for repackaging depends on the materials available and the conditions under which the equipment is shipped or stored. Adapt the procedure outlined below whenever circumstances permit. The information concerning the original material will also be helpful (para 2-1).

a. *Material Requirements.* The following materials are required for packaging TS-2327/APN-168. For stock numbers of materials, refer to SB 38-100, Preservation, Packaging, and Packaging Materials, Supplies and Equipment used by the Army.

Material	Quantity
Cellulosic cushioning material:	
2 pieces _____	16 x 16 1/4 x 1 1/2 in.
1 piece _____	61 x 8 1/2 x 1 1/2 in.

Material	Quantity
Fiberboard (1/4 in. thick 275 pound test) Out- side dimensions.	16 1/2 x 16 3/4 x 11 1/2 in.
Reinforced gum tape --	6 ft
Fiberglass gum tape --	11 ft

b. *Packaging.* (fig. 2-1).

- (1) Place one 16 by 16-1/4 by 1-1/2 inch cellulosic cushion in bottom of carton.
- (2) Wrap TS-2327/APN-168 in the 61-inch long strip of cellulosic cushion as shown in figure 2-1.
- (3) Place the wrapped TS-2327/APN-168 inside carton.
- (4) Place remaining cellulosic cushion on top of TS-2327/APN-168.
- (5) Seal carton using reinforced gum tape and fiberglass tape.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

4-2. Authority for Demolition

The demolition procedures given in paragraph 4-3 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon order of the commander.

4-3. Methods of Destruction

The tactical situation and time available will determine the method to be used when destruction of equipment is ordered. In most cases, it

is preferable to demolish completely some portions of the equipment rather than partially destroy all the equipment units.

a. *Smash.* Use sledges, axes, hammers, and similar tools to smash meters, control panels, and indicators.

b. *Cut.* Use axes, machetes, and similar tools to cut wiring, cording and cabling.

Warning: Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.

c. Burn. Use gasoline, kerosene, flamethrowers, or incendiary grenades to burn cords, cables, spare parts, literature, etc.

d. Explode. Use firearms, grenades, powder

charges, or explosive compounds to demolish equipment where feasible or necessary.

e. Dispose. Scatter or bury destroyed parts or throw them into waterways.

APPENDIX A**REFERENCES**

Following is a list of references available to the operator and organizational repairman of Test Set, Receiver-Transmitter T5-2327/APN-168.

- | | |
|-------------------|---|
| DA Pam 310-4 | Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9) Supply Bulletins, Lubrication Orders, and Modification Work Orders. |
| TB SIG 364 | Field Instruction for Painting and Preserving Electronics Command Equipment. |
| TM 9-213 | Painting Instructions for Field Use. |
| TM 11-6625-200-12 | Organizational Maintenance Manual Multimeters ME-26A/U, ME-26B/U, ME-26C/U, and ME-26D/U. |
| TM 38-750 | Army Equipment Record Procedures. |

APPENDIX B

BASIC ISSUE ITEMS

Section I. INTRODUCTION

B-1. General

This appendix lists items supplied for initial operation. The list includes tools, parts, and material issued as part of the major end item. The list includes all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

B-2. Columns

Columns are as follows:

a. Federal Stock Number. This column lists the 11-digit Federal stock number.

b. Designation by Model. Not used.

c. Description. Nomenclature or the standard item name and brief identifying data for

each item are listed in this column. When requisitioning, enter the nomenclature and description.

d. Unit of Issue. The unit of issue is each unless otherwise indicated and is the supply term by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes.

e. Expendability. Nonexpendable items are indicated by NX. Expendable items are not annotated.

f. Quantity Authorized. Under "Items Comprising an Operable Equipment", the column lists the quantity supplied for the initial operation of the equipment.

g. Illustrations. The "Figure No." column lists the figure and reference numbers used for identification of the items in the illustration.

SECTION II. BASIC ITEMS TEST

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	QTY EXP	QTY AUTH	FIGURE NO.	ILLUSTRATION
ORD THRU AGC		TEST SET, RECEIVER TRANSMITTER TS-2327/APN-168 ITEMS COMPRISING AN OPERABLE EQUIPMENT TECHNICAL MANUAL TM 11-6625-685-12	MX	1	1	1-1	

APPENDIX C

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C-1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature for Test Set, Receiver Transmitter TS-2327/APN-168. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C-2. Explanation of Format for Maintenance Allocation Chart

a. Group Number. Group numbers correspond to the reference designation prefix assigned in accordance with ASA Y32.16, Electrical and Electronics Reference Designations. They indicate the relation of listed items to the next higher assembly.

b. Component Assembly Nomenclature. This column lists the item names of component units, assemblies, subassemblies, and modules on which maintenance is authorized.

c. Maintenance Function. This column indicates the maintenance category at which performance of the specific maintenance function is authorized. Authorization to perform a function at any category also includes authorization to perform that function at higher

categories. The codes used represent the various maintenance categories as follows:

Code	Maintenance Category
C	Operator/Crew
O	Organization Maintenance
F	Direct Support Maintenance
H	General Support Maintenance
D	Depot Maintenance

d. Tools and Equipment. The numbers appearing in this column refer to specific tools and equipment which are identified by these numbers in section III.

e. Remarks. Self explanatory.

C-3. Explanation of Format for Tool and Test Equipment Requirements

The columns in the tool and test equipment requirements chart are as follows:

a. Tools and Equipment. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool for the maintenance function.

b. Maintenance Category. The codes in this column indicate the maintenance category normally allocated the facility.

c. Nomenclature. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

d. Federal Stock Number. This column lists the Federal stock number.

e. Tool Number. Not used.

MAINTENANCE ALLOCATION CHART

C-2

TM 11-6625-685-12

GROUP NUMBER	COMPONENT ASSEMBLY NOMENCLATURE	MAINTENANCE FUNCTIONS										REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REFPAIR	OVERHAUL	
	TEST SET, RECEIVER-TRANSMITTER TS-2327/APN-168	O	O	H	H	O	7,8 7,8	7,8 7,8	6	2,3,4,5	1,2,3,4,5	Meters, switches Replaces knobs, fuses, lamps. Cables for continuity through Test Jacks Replaces switches, transformer, variac, plug-in relay, diodes, differential amplifier, etc. Drift indicator, ground speed indicator, and differential amplifier outputs. Including meters.

MSE-MR Form 6031 (Supersede edition of 1 Sept 55, which is obsolete)
1 Jan 66

TS-2327/APN-168

ESCo-FM 67-66

SECTION III. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOLS AND EQUIPMENT	Maintenance Category	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUMBER
TS-2327/APN-168 (continued)				
1	D	METER TEST SET TS-682/GSM-1	6625-669-0747	
2	H,D	MULTIMETER TS-352/U	6625-242-5023	
3	H,D	MULTIMETER ME-26/U	6625-542-6407	
4	H,D	OSCILLOSCOPE AN/USM-140	6625-987-6603	
5	H,D	TEST SET, TRANSISTOR TS-1836/U	6625-893-2628	
6	H,D	TOOL KIT, ELECTRICAL EQUIPMENT TK-100/G	5180-505-0079	
7	O	TOOL KIT TK-115/U	5180-896-1578	
8	O	MULTIMETER AN/URM-105	6625-581-2036	

By Order of the Secretary of the Army:

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